

Heavy Vehicle and Mobile Equipment Service Technicians and Mechanics

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Significant Points

- Opportunities should be good for persons with formal postsecondary training in diesel or heavy equipment mechanics, especially if they also have training in basic electronics and hydraulics.
- This occupation offers relatively high wages and the challenge of skilled repair work.
- Skill in using computerized diagnostic equipment is becoming more important.

Nature of the Work

Heavy vehicles and mobile equipment are indispensable to many industrial activities, from construction to railroads. Various types of equipment move materials, till land, lift beams, and dig earth to pave the way for development and production. *Heavy vehicle and mobile equipment service technicians and mechanics* repair and maintain engines and hydraulic, transmission, and electrical systems powering farm equipment, cranes, bulldozers, and railcars. (For more detailed information on service technicians specializing in diesel engines, see the statement on diesel service technicians and mechanics elsewhere in the *Handbook*.)

Service technicians perform routine maintenance checks on diesel engines and on fuel, brake, and transmission systems to ensure peak performance, safety, and longevity of the equipment. Maintenance checks and comments from equipment operators usually alert technicians to problems. With many types of modern heavy and mobile equipment, technicians can plug hand-held diagnostic computers into onboard computers to diagnose any component needing adjustment or repair. After locating the problem, these technicians rely on their training and experience to use the best possible technique to solve the problem. If necessary, they may partially dismantle the component to examine parts for damage or excessive wear. Then, using hand-held tools, they repair, replace, clean, and lubricate parts as necessary. In some cases, technicians calibrate systems by typing codes into the onboard computer. After reassembling the component and testing it for safety, they put it back into the equipment and return the equipment to the field.

Many types of heavy and mobile equipment use hydraulics, to raise and lower movable parts. When hydraulic components malfunction, technicians examine them for fluid leaks, ruptured hoses, or worn gaskets on fluid reservoirs. Occasionally, the equipment requires extensive repairs, as when a defective hydraulic pump is replaced.

In addition to conducting routine maintenance checks, service technicians perform a variety of other repairs. They diagnose electrical problems and adjust or replace defective components. They also disassemble and repair undercarriages and track assemblies. Occasionally, technicians weld broken equipment frames and structural parts, using electric or gas welders.

It is common for technicians in large shops to specialize in one or two types of repair. For example, a shop may have individual specialists in major engine repair, transmission work, electrical systems, and suspension or brake systems. The technology used in heavy equipment is becoming more sophisticated with the increased use of electronic and computer-controlled components. Training in electronics is essential for these technicians to make engine adjustments and diagnose problems. Training in the use of hand-held

computers also is necessary, because computers help technicians diagnose problems and adjust the functions of components.

Service technicians use a variety of tools in their work: power tools, such as pneumatic wrenches, to remove bolts quickly; machine tools, like lathes and grinding machines, to rebuild brakes; welding and flame-cutting equipment, to remove and repair exhaust systems; and jacks and hoists, to lift and move large parts. Service technicians also use common handtools—screwdrivers, pliers, and wrenches—to work on small parts and to get at hard-to-reach places. They may use a variety of computerized testing equipment to pinpoint and analyze malfunctions in electrical systems and other essential systems. For example, tachometers and dynamometers serve to locate engine malfunctions. Service technicians also use ohmmeters, ammeters, and voltmeters when working on electrical systems.

Mobile heavy equipment mechanics and service technicians keep construction and surface mining equipment, such as bulldozers, cranes, crawlers, draglines, graders, excavators, and other equipment, in working order. Typically, these workers are employed by equipment wholesale distribution and leasing firms, large construction and mining companies, local and Federal governments, and other organizations operating and maintaining heavy machinery and equipment fleets. Service technicians employed by the Federal Government may work on tanks and other armored equipment.

Farm equipment mechanics service, maintain, and repair farm equipment, as well as smaller lawn and garden tractors sold to suburban homeowners. What typically was a general repairer's job around the farm has evolved into a specialized technical career. Farmers have increasingly turned to farm equipment dealers to service and repair their equipment because the machinery has grown in complexity. Modern equipment uses more electronics and hydraulics, making it difficult to perform repairs without some specialized training.

Farm equipment mechanics work mostly on equipment brought into the shop for repair and adjustment. During planting and harvesting seasons, they may travel to farms to make emergency repairs to minimize delays in farm operations.

Railcar repairers specialize in servicing railroad locomotives and other rolling stock, streetcars and subway cars, or mine cars. Most work for railroads, public and private transit companies, and railcar manufacturers.



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Working Conditions

Service technicians usually work indoors, although many make repairs at the worksite. To repair vehicles and equipment, technicians often lift heavy parts and tools, handle greasy and dirty parts, and stand or lie in awkward positions. Minor cuts, burns, and bruises are common; serious accidents normally are avoided when the shop is kept clean and orderly and when safety practices are observed. Technicians usually work in well-lighted, heated, and ventilated areas. However, some shops are drafty and noisy. Many employers provide uniforms, locker rooms, and shower facilities.

When heavy or mobile equipment breaks down at a construction site, it may be too difficult or expensive to bring it into a repair shop, so the shop often sends a field service technician to the site to make repairs. Field service technicians work outdoors and spend much of their time away from the shop. Generally, the more experienced service technicians specialize in field service. They usually drive trucks specially equipped with replacement parts and tools. On occasion, they must travel many miles to reach disabled machinery. Field technicians normally earn a higher wage than their counterparts, because they are required to make on-the-spot decisions that are necessary to serve their customers.

The hours of work for farm equipment mechanics vary according to the season of the year. During the busy planting and harvesting seasons, mechanics often work 6 or 7 days a week, 10 to 12 hours daily. In slow winter months, however, mechanics may work fewer than 40 hours a week.

Employment

Heavy vehicle and mobile equipment service technicians and mechanics held about 176,000 jobs in 2002. Approximately 126,000 were mobile heavy equipment mechanics, 35,000 were farm equipment mechanics, and 15,000 were railcar repairers. About a third were employed by machinery, equipment, and supplies merchant wholesalers. More than 12 percent were employed by Federal, State, and local governments, and another 12 percent worked in construction, primarily for specialty trade contractors and highway, street, and bridge construction companies. Other service technicians worked in agriculture; mining; rail transportation and support activities; and commercial and industrial machinery and equipment rental, leasing, and repair. A small number repaired equipment for machinery and railroad rolling stock manufacturers or lawn and garden equipment and supplies stores. Less than 5 percent of service technicians were self-employed.

Nearly every section of the country employs heavy and mobile equipment service technicians and mechanics, although most work in towns and cities where equipment dealers, equipment rental and leasing companies, and construction companies have repair facilities.

Training, Other Qualifications, and Advancement

Many persons qualify for service technician jobs through years of on-the-job training, but most employers prefer that applicants complete a formal diesel or heavy equipment mechanic training program after graduating from high school. They seek persons with mechanical aptitude who are knowledgeable about the fundamentals of diesel engines, transmissions, electrical systems, and hydraulics. In addition, the constant change in equipment technology makes it necessary for technicians to be flexible and have the capacity to learn new skills quickly.

Many community colleges and vocational schools offer programs in diesel technology. Some tailor programs to heavy equipment mechanics. These programs educate the student in the basics of analytical and diagnostic techniques, electronics, and hydraulics. The increased use of electronics and computers makes training in

the fundamentals of electronics essential for new heavy and mobile equipment mechanics. Some 1- to 2-year programs lead to a certificate of completion, whereas others lead to an associate degree in diesel or heavy equipment mechanics. These programs not only provide a foundation in the components of diesel and heavy equipment technology, but also enable trainee technicians to advance more rapidly to the journey, or experienced worker, level.

A combination of formal and on-the-job training prepares trainee technicians with the knowledge to service and repair equipment handled by a shop. After a few months' experience, most beginners perform routine service tasks and make minor repairs. As they prove their ability and competence, they advance to harder jobs. After trainees master the repair and service of diesel engines, they learn to work on related components, such as brakes, transmissions, and electrical systems. Generally, a service technician with at least 3 to 4 years of on-the-job experience is accepted as fully qualified.

Many employers send trainee technicians to training sessions conducted by heavy equipment manufacturers. The sessions, which typically last up to 1 week, provide intensive instruction in the repair of the manufacturer's equipment. Some sessions focus on particular components found in the equipment, such as diesel engines, transmissions, axles, and electrical systems. Other sessions focus on particular types of equipment, such as crawler-loaders and crawler-dozers. As they progress, trainees may periodically attend additional training sessions. When appropriate, experienced technicians attend training sessions to gain familiarity with new technology or equipment.

High school courses in automobile repair, physics, chemistry, and mathematics provide a strong foundation for a career as a service technician or mechanic. It is also essential for technicians to be able to read and interpret service manuals in order to keep abreast of engineering changes. Experience working on diesel engines and heavy equipment acquired in the Armed Forces is valuable as well.

Voluntary certification by the National Institute for Automotive Service Excellence is recognized as the standard of achievement for heavy vehicle and mobile equipment service technicians, who may be certified as a master heavy-duty diesel technician or in a specific area of heavy-duty equipment repair, such as brakes, gasoline engines, diesel engines, drivetrains, electrical systems, or suspension and steering. For certification in each area, technicians must pass a written examination and have at least 2 years' experience. High school, vocational or trade school, or community or junior college training in gasoline or diesel engine repair may substitute for up to 1 year's experience. To remain certified, technicians must be retested every 5 years. Retesting ensures that service technicians keep up with changing technology. However, there are currently no certification programs for other heavy vehicle and mobile equipment repair specialties.

The most important work possessions of technicians are their handtools. Service technicians typically buy their own handtools, and many experienced technicians have thousands of dollars invested in them. Employers typically furnish expensive power tools, computerized engine analyzers, and other diagnostic equipment, but handtools are normally accumulated with experience.

Experienced technicians may advance to field service jobs, wherein they have a greater opportunity to tackle problems independently and earn additional pay. Technicians with leadership ability may become shop supervisors or service managers. Some technicians open their own repair shops or invest in a franchise.

Job Outlook

Opportunities for heavy vehicle and mobile equipment service technicians and mechanics should be good for those who have com-

pleted formal training programs in diesel or heavy equipment mechanics. Persons without formal training are expected to encounter growing difficulty entering these jobs.

Employment of heavy vehicle and mobile equipment service technicians and mechanics is expected to grow slower than the average for all occupations through the year 2012. Most job openings will arise from the need to replace experienced repairers who retire. Employers report difficulty finding candidates with formal postsecondary training to fill available service technician positions, because many young people with mechanic training and experience opt to take jobs as automotive service technicians, diesel service technicians, or industrial machinery repairers—jobs that offer more openings and a wider variety of locations in which to work.

Faster employment growth is expected for mobile heavy equipment mechanics than for farm equipment mechanics or railcar repairers. Increasing numbers of heavy duty and mobile equipment service technicians will be required to support growth in the construction industry, equipment dealers, and rental and leasing companies. Because of the nature of construction activity, demand for service technicians follows the Nation's economic cycle. As the economy expands, construction activity increases, resulting in the use of more mobile heavy equipment to grade construction sites, excavate basements, and lay water and sewer lines. The increased use of such equipment increases the need for periodic service and repair. In addition, the construction and repair of highways and bridges requires more technicians to service equipment. As equipment becomes more complicated, repairs increasingly must be made by specially trained technicians. Job openings for farm equipment mechanics and railcar repairers are expected to arise mostly because of replacement needs.

Construction and mining are particularly sensitive to changes in the level of economic activity; therefore, heavy and mobile equipment may be idled during downturns. In addition, winter is traditionally the slow season for construction and farming activity, particularly in cold regions. Few technicians may be needed during periods when equipment is used less; however, employers usually try to retain experienced workers. Employers may be reluctant to hire inexperienced workers during slow periods.

Earnings

Median hourly earnings of mobile heavy equipment mechanics were \$17.29 in 2002. The middle 50 percent earned between \$14.13 and \$20.88. The lowest 10 percent earned less than \$11.54, and the highest 10 percent earned more than \$24.90. Median hourly earnings in the industries employing the largest numbers of mobile heavy equipment mechanics in 2002 were as follows:

Federal Government	\$19.44
Local government	18.03
Other specialty trade contractors	17.72
Machinery, equipment, and supplies merchant wholesalers	17.10
Commercial and industrial machinery and equipment rental and leasing	15.81

Median hourly earnings of farm equipment mechanics were \$13.03 in 2002. The middle 50 percent earned between \$10.50 and \$16.01. The lowest 10 percent earned less than \$8.73, and the highest 10 percent earned more than \$18.86.

Median hourly earnings of railcar repairers were \$18.78 in 2002. The middle 50 percent earned between \$15.65 and \$21.18. The lowest 10 percent earned less than \$12.07, and the highest 10 percent earned more than \$23.76. In 2002, median hourly earnings

were \$19.72 in rail transportation, the industry employing the largest number of railcar repairers.

Many heavy vehicle and mobile equipment service technicians and mechanics are members of unions, including the International Association of Machinists and Aerospace Workers, the International Union of Operating Engineers, and the International Brotherhood of Teamsters.

Related Occupations

Workers in related repair occupations include aircraft and avionics equipment mechanics and service technicians; automotive service technicians and mechanics; diesel service technicians and mechanics; heating, air-conditioning, and refrigeration mechanics and installers; and small engine mechanics.

Sources of Additional Information

More details about job openings for heavy vehicle and mobile equipment service technicians and mechanics may be obtained from local heavy and mobile equipment dealers and distributors, construction contractors, and government agencies. Local offices of the State employment service also may have information on job openings and training programs.

For general information about a career as a heavy vehicle and mobile equipment service technician or mechanic, contact:

► The Equipment Maintenance Counsel, P.O. Box 1368, Glenwood Springs, CO 81602. Internet: <http://www.equipment.org>

► The AED Foundation (Associated Equipment Dealers affiliate), 615 W. 22nd St., Oak Brook, IL 60523. Internet:

http://www.aednet.org/aed_foundation

For a directory of public training programs in heavy and mobile equipment mechanics, contact:

► SkillsUSA-VICA, P.O. Box 3000, Leesburg, VA 20177-0300. Internet: <http://www.skillsusa.org>

A list of certified diesel service technician training programs can be obtained from:

► National Automotive Technician Education Foundation (NATEF), 101 Blue Seal Dr., Suite 101, Leesburg, VA 20175. Internet: <http://www.natfe.org>

Information on certification as a heavy-duty diesel service technician is available from:

► National Institute for Automotive Service Excellence (ASE), 101 Blue Seal Dr. SE., Suite 101, Leesburg, VA 20175. Internet: <http://www.asecert.org>